Acceptability factors to transport policy changes

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INTRODUCTION

Vis-à-vis the scarcity of resources (e.g. space dedicated to transport and public money) and the environmental implication of transport, the stake today is to implement new regulations in order to improve the transport system efficiency. According to the prescription of economic theory, several European and national documents advocate the introduction of more pricing instruments into the current regulation of the transport system as well as more efficiency into pricing, particularly through the principle of marginal cost pricing (cf. European Commission 1995 and 1998).

The debate around these proposals is all the more sharp since the decisions about pricing and regulation in transport touch fundamental aspects of our society, such as liberty of travel, equity and non-discrimination, which cannot be left completely to the free market.

The recent failures of some tolling schemes in French urban areas (e.g. in Lyon or Toulouse), the constant opposition of the opinion to the introduction of congestion pricing in spite of the intellectual seduction that this concept has exerted on the economists for more than 75 years, show that it is necessary to analyse the ways to make acceptable a more efficient transport policy.

When one analyses the reactions of the various stakeholders to the documents previously quoted (PATS, 2000), in fact primarily questions of equity arise. They are as well questions of equal treatment between modes or operators, as of risk of aggravation of the inequalities between users or consumers, of concern of preservation of social and spatial solidarity at the various geographic levels, from local government to European level. The benefit and burden sharing coming from changes in transport policy is of course the main issue.

First of all it should be underlined that there is no *a* theory of acceptability. A central assumption is that acceptability mostly relies on the two conditions of efficiency and equity: a policy measure that is perceived as insufficiently efficient and insufficiently fair is thus doomed to be rejected. The corollary of this assumption is that to be acceptable a transport policy must reach a minimal degree of efficiency and a minimal degree of equity. By saying that, it is stated that there is no identity between efficiency and fairness and that the first has not automatically implicit the second. In addition, these conditions are

necessary though not sufficient to guarantee the acceptability of a pricing policy.

In the first section we elaborate an analytical framework of acceptability which will be applied in the second section to a series of case studies. This application will help to validate the framework and infer relevant ways of improvement of acceptability of transport pricing schemes.

1. AN ANALYTICAL FRAMEWORK OF ACCEPTABILITY

Firstly we recap the principles of optimal pricing and investment. Secondly we develop the analysis of equity through its various dimensions. Finally we elaborate the analytical framework of acceptability which combines these dimensions of efficiency and equity.

1.1. Efficiency: optimal pricing and investment

Efficiency in its economic meaning relies on a rather solid theoretical basis: efficient pricing of transport infrastructure and public transport services is a necessary condition for maximising the social surplus, i.e. the sum of the producers' surplus and the consumers' surplus for all goods and services, on the side-condition that all external costs are internalised. In the case of transport infrastructure the short-run efficiency implies that the capacity is given, and the goal is to make the best use of the existing capacity. This implies that infrastructure use and public transport service should be in general priced on a social marginal cost basis. In the long-run the efficiency condition is that investments in transport infrastructure should be undertaken up to the point where benefits just exceed costs (Small, 1992a).

However this result supposes inter alia that the remainder of the economy is at the optimum, i.e. prices, at least in the sectors of the economy related to the sector studied, are equal to the marginal costs, which is often not the case. The "second-best" theorem stipulates that in this case of non-optimality of the other sectors, pricing at marginal cost in a sector does not necessarily lead to an optimum in this sector and can even move it away from the optimum (Feldman, 1997). For example, if one cannot price urban public transport at marginal cost in an agglomeration, because of a constraint of costs coverage imposed for considerations of budgetary restriction, the pricing of car use at marginal cost will be inefficient. Indeed the cost coverage for urban public transport would imply a rise in the fares beyond the marginal cost of use, which would produce a social loss compared to the optimum: to avoid that, and in particular a shift of public transport users towards the car, the pricing of car use should also move away from its marginal cost.

This theorem of the "second-best" thus seems to singularly weaken the theoretical prescription of marginal cost pricing. However that does not call into question the principle of pricing in itself. Several works show case by case - under-pricing of a competing mode or constraint of budget balance on a particular mode -, how pricing must deviate from marginal cost (Quinet, 1998). There is thus a consensus to judge that it is more efficient to charge something for congestion and environmental externalities, rather than to

charge nothing or to charge a price a disconnected from the marginal cost. Concretely that means a pricing which varies with the degree of congestion or nuisances (accidents, noise, pollution) emitted by the various transport modes. Obviously this prescription comes up against considerations of equity.

1.2. How to characterise equity?

On the opposite, there is a great diversity of conceptions of equity. The perception of the inequalities calls upon complex mechanisms of comparison, function of the objective inequalities but also many other variables. A difference is sometimes seen legitimate, sometimes illegitimate, whatever its objective extent. We must also underline that there is not *a* theory of equity but multiple meanings of the concept, resulting from the history of the human societies, or proposed by various social and human sciences, in particular philosophy or economics (Sen, 1987).

Our approach of equity in transport consists in explicitly taking into account the inequalities of distribution of the goods, as proposed by Rawls in his theory of justice (1971). It consists in considering the principles of justice as being the subject of an original agreement in the society.

The first principle called “principle of liberty”, and to which Rawls gives the priority, (“each person is to have an equal right to the most extensive basic liberty compatible with similar liberty for others”) relates to the civil rights of the person. The second principle, including efficiency and equity according to Rawls, relates to the allocation of resources between the individuals, namely (a) the famous “principle of difference” and (b) the principle of equality of opportunities.

The theory of Rawls enables us to elaborate three dimensions of equity directly applicable to the transport field and its pricing. We define

- territorial equity, corresponding to the “principle of liberty”, in which the society must guarantee everywhere the access rights to the goods and the services;
- horizontal equity, corresponding to the “principle of equal opportunity”, which concerns the equal treatment between users and the user-pays principle (be it for a “bad” i.e. congestion or nuisances or for a “good” i.e. better service);
- vertical equity, corresponding to the “principle of difference”, which explicitly takes into account the inequalities and its consequences as regards transport.

Litman (1997) previously evoked two types of equity, horizontal equity and vertical equity, without explicitly binding them to the theory of Rawls. We distinguish in addition *territorial equity*, because of the specificity of transport which conditions accessibility at the various points in space.

1.3. The analytical framework of acceptability

Some contradictions were raised between these various dimensions and with the objective of economic efficiency (see Figure 1).

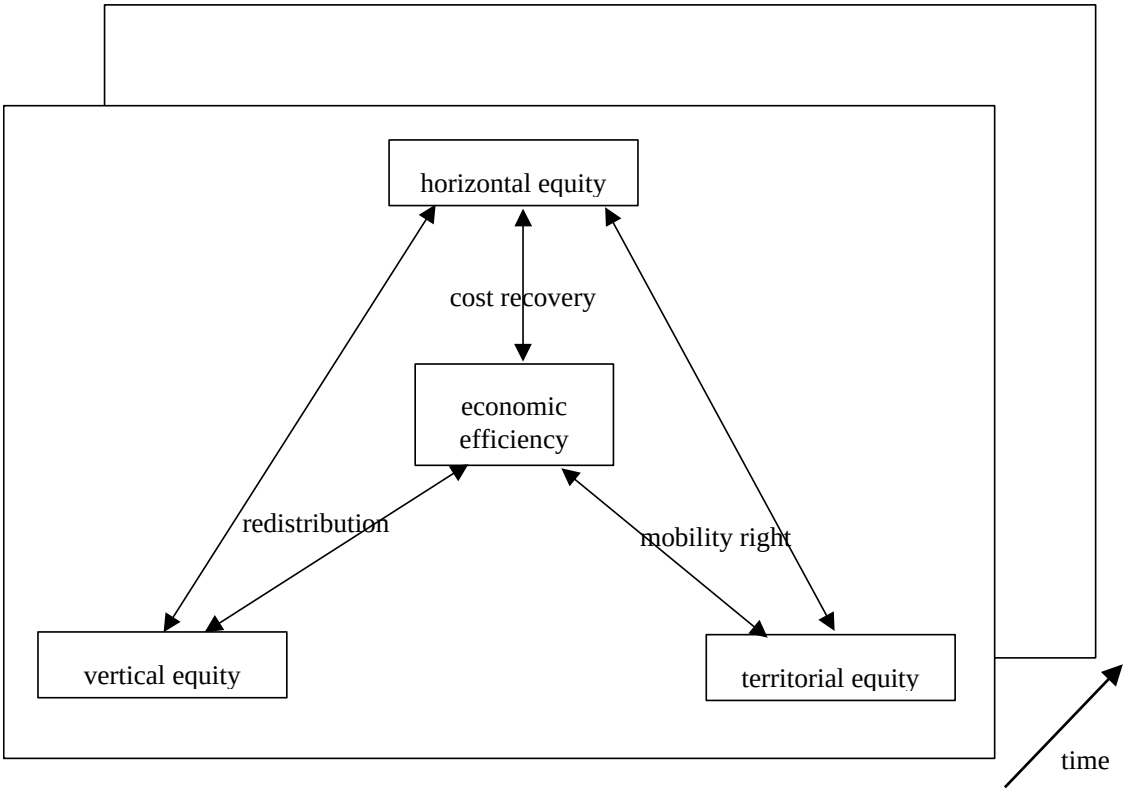

Figure 1 : Relationships between equity dimensions and efficiency

The economic efficiency and the horizontal equity can each one involve price increases going against vertical equity (attention paid to those most penalised). Conversely, vertical equity requires mechanisms of redistribution or compensations which challenge the economic efficiency of pricing and the user-pay principle of horizontal equity.

The economic efficiency and the horizontal equity can also each one involve price increases going against territorial equity, by challenging the right to mobility. Conversely, the preservation of this right requires investments and imposes limits on the prices, being likely to challenge the economic efficiency of pricing and the user-pays principle of horizontal equity.

Finally the economic efficiency (marginal cost pricing) and the user-pays principle of horizontal equity are generally incompatible because marginal and average costs are mostly different (Roy, 1998). However some compatibility can be found within the framework of “transport funds”: horizontal equity is not required any more for each mode or each infrastructure but from the point of view of a transport service, within the perimeter of the transport funds.

The implementation of changes in transport pricing implies to apply longitudinally this framework, according to the four entries of economic efficiency and equity:

- Economic efficiency implies changes in pricing, including pricing something that was previously perceived as “free”. Some actors may consider themselves as losers, i.e. perceive a degradation of their

own situation, when compared to the period before the implementation of the new pricing measure (e.g. “I pay more than before without drawing from it more benefit”). Reluctance to such price increase can be in some cases overcome if higher quality or capacity is delivered. However pricing changes may conflict with the following equity dimensions.

- Territorial equity or principle of liberty, implies the free exercise of the right to mobility of the people and the goods. On the one hand the maintenance of this freedom imposes obvious limits on the increase in transport pricing, and on the other hand this freedom remains contained within the limits of the general interest of the society.
- Horizontal equity or user-pays principle, implies a better coverage of the costs by the users. However with pricing changes implied by this equity principle some actors concerned may consider themselves as losers, comparatively to the others (e.g. “I pay more than the others with regard to the costs that I inflict and to the advantages that I bring to the society”).
- Vertical equity or principle of maximisation of the situation of most penalised groups or areas, implies that any policy which is likely to worsen the situation of the least advantaged groups or the least served areas, or even which openly does not aim at an improvement of these situations, is very likely to be rejected. It results from this that the principles of allocation of revenues from pricing play, by their more or less distributive character, a central role in the acceptability of pricing.

These three dimensions of equity are indivisible from the perception of the fairness of a transport policy. They are also related to the criterion of economic efficiency, which cannot be durably ignored. This set of contradictory constraints thus forms the framework of definition and management of transport policies, which aim at being both equitable and efficient. It results from these incompatibilities that one will obtain at best only an imperfect compromise between the economic efficiency and these three dimensions of equity.

2. APPLICATION

The previous analytical framework of acceptability is then applied to a series of four case studies which are exemplary of often controversial implementation of road user charging in urban or suburban areas.

2.1. SR 91 Express lanes (California)

The State Road 91 is a 2 x 4 lanes section of freeway in Orange County. It is located in an extremely congested commuter route connecting the employment centers of Orange and Los Angeles Counties with rapidly growing eastern suburbs (congestion occurs between 4:00 a.m and 8:00 a.m and between 3:00 p.m and 7:00 p.m). The introduction of “Express Lanes”, in December 1995, is an implementation of congestion pricing with a new-

capacity toll road. This system added two lanes in each direction in the median strip of the existing freeway along a 16-km stretch in Orange County (Garnier, 1998).

The cost of the road was $126 million (1 USD ≅ 1 Euro), including the technology component, and privately financed. Prices are not regulated but the corporation is limited to a maximum internal rate of return, with any excess revenues going to State and local highway projects (Small and Gomez-Ibanez, 1998).

While the original freeway lanes remain free, the Express lanes are tolled, except for motorcycles and high-occupancy vehicles with three or more passengers. Heavy trucks are excluded. Technology is based on a windshield transponder that automatically collects tolls. This makes easier a flexible congestion pricing mechanism (in the initial phase, there were 5 preset toll levels between $0.25 and $2.50, these have been extended to 9 levels in 1998). Moreover drivers are informed onboard on the current price (provided that they have the transponder). They also have the time to decide to use the toll road at each of the three entry points during one-and-a-half miles of road.

2.2. The cordon toll of Trondheim (Norway)

Since the Eighties the Norwegian agglomeration of Trondheim (250.000 inhabitants) has undergone the problems of a growing traffic (approximately 50% of the traffic was through traffic) and the lack of financial resources to improve the road system. In September 1991, a cordon toll was set up around the center of the city, i.e. a 4km by 6km area, containing 40,000 inhabitants and many business and administrative units as well as the port (Norwegian Public Roads Administration, 1999).

The main aim is to generate revenues to finance the improvement of the transport infrastructures, jointly with governmental funds. This explains why the level of toll is low and varies little during the day. The capital spending program in transport was estimated at 2,2 billion NOK (1 NOK ≅ 0.12 Euro) over a 15 years period, with a planned contribution of 60% by the toll receipts. The town council also decided that 20% of the toll receipts would go to public transport and the improvement of safety and environment (pedestrians, cyclists).

The cordon toll imposes a payment on each passage inbound. Toll was initially collected on 12 points which control all the entries to the center. Toll operates from 6 am to 5 pm and the price is higher in morning peak hours (6 am to 10 am). The access is free in the evening and the weekend. Upon the departure the system was designed to function with the technology of automatic identification and debiting of the vehicles and a marketing policy to promote the onboard unit makes that more than 90% of the vehicles pass the cordon without stopping.

The basic price was 12 NOK in 1999. For a subscriber by prepayment of 5,000 NOK, the reduction amounts 60% in off-peak hour against 40% in peak hour. These reductions are respectively 40% and 20% for prepayment of 500 NOK. The price is doubled for the heavy vehicles. The access is free for the motor bikes. The border effects are limited by the fact that the driver who

crosses several times the cordon will pay to the maximum only one time per hour or 60 times per month (that relates to only 5% of the users).

A third of the drivers lived inside the initial cordon and thus paid toll rarely whereas they benefited from the system. For reasons of equity and the need to increase the receipts, the cordon was redesigned in 1998 with 21 collecting points, so as to affect a greater part of the traffic.

2.3. Motorway A1 in North of Paris (France)

Autoroute A1 is a toll motorway connecting Paris to Lille, about 200 km to the north. The A1 is subject to heavy inbound traffic near Paris on Sunday afternoons and evenings.

In April 1992, a time-varying toll scheme has been implemented for Sundays only: this is a modulation of the existing flat toll (52 FF in 1992 from Lille to Paris; 1 FF = 0.15 Euro). The objective was to spread the peak demand.

A « red tariff » 25 percent higher than the normal toll is charged during the Sunday peak period (16:30-20:30). A « green tariff » 25 percent lower than the normal toll is charged before (14:30-16h30) and after the peak (20:30-23:30). These hours and rates were designed so that total revenues are nearly identical to those collected with the normal toll (EUROTOLL, 1999).

2.4. The Northern ring road of Lyon (France)

The Northern ring road of Lyon is a toll road infrastructure with an overall length of 10 km, including a viaduct and three tunnels. It prolongs an existing free ring road in the East, by-passes by the North the heart of the agglomeration while passing through an already very urbanised area: that explains why about two thirds of the infrastructure are underground. The total cost of the operation rose in 1997 to 6 billion FF, of which a little more than half (52%) were financed by the public funds (interchanges and subsidies to the concessionaire). The remainder was to be initially covered by the tolls. The contract of concession also envisaged the reduction of capacity of parallel existing free roads.

The infrastructure opened in August 1997 and caused upon the departure a significant movement of refusal on behalf of the drivers. Indeed they discovered at the same time the new infrastructure with toll and the restrictions on the parallel free roads: the indications and the technical configuration of the Eastern ring were thought to direct the traffic in the new Northern toll infrastructure. A burst of boycott of the new infrastructure started, accompanied by demonstrations each week at the toll barriers, preventing the payment by the users, and sometimes with destruction of these barriers. In parallel, because of lawsuit by the opponents to this toll emerged (a) first of all in September 1997 a partial re-establishment of the capacity of free flow on a parallel boulevard, then (b) a cancellation of the private concession by the Supreme Court in the beginning of 1998.

After the cancellation, the motorway has been run by a public agency (régie) and the tolls have considerably been reduced by decision of the Mayor. Only

the central tunnel (3.5 km) is now tolled and the price has been reduced to 10FF.

2.5. Synthesis

Table 1 synthesises the evaluation of the economic efficiency and equity dimensions for the four case studies which were described previously.

A horizontal reading of Table 1 makes it possible to evaluate how each dimension of equity is declined in the various cases studies.

The best economic efficiency is obtained by the modulation of an existing toll (cf. A1). However a "second best" solution can be obtained in certain cases of financing tolls (cf. SR91 and Trondheim), which represent a compromise between economic efficiency (i.e. to charge the avoidance of congestion) and horizontal equity (i.e. to cover the costs while offering a service).

Improving horizontal equity through an explicit counterpart is not always enough to counterbalance other negative effects, in particular on vertical and territorial dimensions of equity, as shown by the example of Téo. A contrario the counterpart can be limited (limited fluidity of the traffic on peak hours in the A1 case) but the redistribution of the receipts between peak and off-peak users without additional receipts for the operator, makes it possible to maintain horizontal equity in the view of the users.

Vertical equity constitutes an obvious stumbling block when quasi-obligation to pay and high price combine as in the Téo case. A contrario a moderate price and a partial redistribution can be accompanied by an obligation to pay (cf. Trondheim). Another way of improving this vertical equity consists, in the case of a congestion toll, to offer an obvious compensation to those who accept to change their travel schedule (cf. A1).

Territorial equity is generally likely to be degraded or only maintained when additional pricing is introduced on transport infrastructures. Here again a combination of a quasi-obligation to pay and a high price calls strongly into question the territorial equity. To avoid this price increase must be moderate as indicated by the example of Trondheim.

A vertical reading of Table 1 makes it possible to evaluate through each case study how the various dimensions of efficiency and equity enter into synergy.

The case of Téo shows how a measure of restriction of the parallel free roads has a negative effect simultaneously on three dimensions of equity: these negative effects feed themselves reciprocally to contribute to the rejection of this scheme. It was however a necessary measure to guarantee a minimal flow of paying users and thus ensure the financial balance of the project.

A contrario the SR 91 case shows that there may exist some combinations of financial cost of infrastructure and price attracting sufficient customers (i.e. rather rich, having a value of time justifying the toll payment for the saving of time they get), authorising a financially balanced operation: thus horizontal equity is maintained (costs coverage) and even made more acceptable (counterpart) without calling into question vertical and territorial dimensions of equity as in the Téo case. Such schemes are also a good compromise with the economic efficiency when they make pay (the avoidance of) congestion.

		Téo - Lyon		SR91 - California		Trondheim - Norway		A1 – North of Paris
Economic efficiency	–	– Toll on bypass whereas more significant nuisances in the center + modulation according to congestion	++	+ Toll for the avoidance of congestion (~second-best solution) + elaborate modulation according to congestion	+	+ Toll to finance the future investments (~ to avoid the future congestion) slight peak pricing modulation	++	Peak tolling (modulation of an existing financing toll)
Horizontal equity	–/ =	– Costs coverage by the users < 50% + counterpart – drivers of certain sectors of the agglomeration forced to pay (discrimination)	++	+ Infrastructure costs totally covered by the users + counterpart	+	– costs partially covered by the users + the maximum of the drivers are affected (non-discrimination) + (future) counterpart	=	+ Costs coverage by toll is ensured as before (no additional receipts for the operator) – limited counterpart (slight fluidity at the peak hours)
Vertical equity	–	Restrictions of capacity on parallel free roads, hence increase in the user costs without alternative for the economically fragile classes	=	No restriction on the existing free road, therefore no direct incidence	= / +	– No alternative to toll for the drivers + moderate price + redistribution of part of the receipts towards public transport	= / +	+ Redistribution of the receipts between users – Possible captivity vis-a-vis the schedules but limited (weekend returns)
Territorial equity	––	Restrictions of capacity on parallel free roads	=	No restriction on the existing free road	–	Initially border (cordon), effects but moderate price	=	No amendment

(+ +, +, =, – –– is a notation of the " after " situation compared with the " before " situation)

Table 1

The case of Trondheim represents a generalisation of the previous principle, where one seeks on an agglomeration level to solve the problem of cost coverage: a wide multi-cordon toll makes it possible to affect the maximum of drivers (horizontal equity) while guaranteeing a future counterpart; a moderate price and a partial redistribution of the receipts towards public transport avoid the pitfalls of territorial and vertical dimensions of equity.

The case of the modulation of toll on the motorway A1 represents a good example of economic efficiency to manage the congestion. This modulation is made possible because (a) it starts from the existence of a flat toll to which the users are accustomed, (b) the price in off-peak hour is lowered, thus offering a compensation to those who agree to modify their hour of travel, and (c) the redistribution of the receipts is carried out between motorists without additional profit for the operator. However this pricing scheme is not applied on weekdays.

The argumentation of this analysis shows the ways according to which the chances of success of urban traffic charging schemes could be increased.

Toll on new roads applies only to the areas where, taking into account the price imposed by the costs of construction of the new infrastructures, there exists sufficient customers ready to pay: that is shown for instance by the SR 91 case in the rich Orange county in California (and also the toll tunnel Prado-Carénage in the centre of Marseilles), and a contrario by the failure of Téo in Lyon.

However, even in these cases of possible application, there is still the importance of the network effects in an urban area: the drivers who drive through the toll roads free the capacity of other roads for other drivers. An efficient pricing scheme is likely better to be designed on the agglomeration level and not on particular links.

Whenever toll on new roads is impossible, because the potential customers are insufficient given the construction costs, the need for cost coverage is added to the existence of the network effects previously evoked, to justify a mutual costs coverage by all the drivers on the agglomeration level: this follows the example of Trondheim toll. Moreover the treatment on the same level of all the drivers of the agglomeration makes it possible to improve horizontal equity between them.

The toll modulation according to the charge of traffic, first step towards the economic efficiency, is accepted when it is accompanied by a tangible counterpart (e.g. SR91) or an obvious compensation like a reduced toll compared to an existing basic toll (example of A1).

The short or medium term captivity of the households regarding the relative locations of their residence and their employment makes that the increase in the user transport costs cannot be too abrupt and that visible alternatives must be offered, in order to conform to the criteria of vertical and territorial equity.

CONCLUSION

We have thus worked out an analytical framework of the acceptability of pricing changes in the transport sector. This framework combines the dimensions of economic efficiency (to manage the demand efficiently), territorial equity (guarantee of accessibility), horizontal equity (user-pays principle), and vertical equity (welfare of most underprivileged).

The application of this framework was validated on some urban or suburban road toll case studies. The analysis showed that these dimensions of efficiency and equity generally reinforce themselves in their negative or positive aspects. This analysis also showed that these various dimensions of equity cannot be ignored on pain of failure. Moreover the ways according to which the acceptability of urban road user charging could be improved, if not guaranteed, were identified.

In a more general way, a possible strategy consists in starting from the couple horizontal equity – economic efficiency around which the controversies between public authorities, operators and users are established. These controversies can be solved through the concept of transport funds, which combines the principles of efficient pricing and costs coverage, in a perimeter defined by a given area (e.g. an urban centre) or relation (e.g. a corridor), and a set of transport modes. The two former principles would form the heart of the specification of such transport funds. Regarding equity the vertical (maintenance of social cohesion) and territorial (maintenance of space cohesion) dimensions would be added to this specification, but with a political and financial commitment of the public authorities to cover the additional costs which would result from this addition.

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